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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/608,091	06/30/2003	Robert J. Steger	015290-682	8130

EXAMINER	
DHINGRA, RAKESH KUMAR	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/608,091	STEGER, ROBERT J.	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 15-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 15-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 June 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Figure 2: Reference number 65 as shown in the drawing is not mentioned in the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Response to Arguments

Applicant's arguments, see pages 10-18, filed 6/26/06, with respect to the rejection(s) of claim(s) 1-12, 15-23 under 35 USC 103 (a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made as explained below.

New reference has been found (US patent No. 5,225,663, Matsumura et al) that when combined with Tamura et al reads on limitations of claim 1 and dependent claims 2, 4,

6, 7, 9, 11, 12. Accordingly claims 1, 2, 4, 6- 9, 11, 12 have been rejected under 35 USC 103 (a) as explained below. Further, another new reference has been found (US PGPUB No. 2004/0163601, Kadotani et al) that when combined with Tamura et al and Matsumura et al reads on limitations of claim 15. Accordingly claim 15 and dependent claims 3, 16, 18, 20, 22, 23 have been rejected under 35 USC 103 (a) as explained below. Further, dependent claims 5, 10, 17, 19, 21 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 6, 7, 9, 11, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura et al (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663).

Regarding Claims 1, 2: Tamura et al discloses a substrate support useful in a reaction chamber of a plasma processing apparatus (Fig. 9), the substrate support comprising: a ceramic member (Fig. 9 Item 40); a metallic heat transfer member overlying the ceramic member (Fig. 9 Item 2), the heat transfer member including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member (Fig. 9 Item 42); and an electrostatic chuck overlying the heat transfer member (Fig. 9

Item 18), the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus (Fig. 9 Item 1) [column 14, lines 35-50].

Tamura et al do not teach thickness of heat transfer member.

Matsumura et al teach an apparatus (Figures 1-3) for processing a semiconductor wafer 8 comprising of a heat transfer plate 1 (having a conductive film heater 2) and a heat insulator 5. Matsumura et al also teach that the heat transfer plate 1A is made of aluminum and can have a thickness varying from 0.1 to 5 mm and that thickness of heat transfer plate is directly related to its heat transfer capacity. Matsumura et al further teach (Figure 2) that by controlling the thickness of heat transfer plate (besides other factors), the heat capacity required and time taken to heat the wafer to a desired temperature could be controlled. Thus, prior art teaching by Matsumura et al anticipates the claimed thickness of heat transfer plate (that is, 1/8 to ¼ inches or 3.17 mm to 6.35 mm) [column 4, line 5 to column 6, line 25].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to control maximum thickness of heat transfer member as taught by Matsumura et al in the apparatus of Tamura et al et al to enable control thermal mass of heat transfer member for achieving desired heating/cooling rate of wafer.

Regarding Claim 4: Tamura et al disclose that substrate support further comprises a source of temperature controlled liquid (coolant supply portion) in flow communication with the at least one flow passage (Fig. 9 Item 43 and column 14, lines 35-50).

Regarding Claim 6: Tamura et al discloses a heat transfer gas source operable to supply a heat transfer gas between the support surface and the substrate (Fig. 9 Item 21), and a controller operable to (i) control the volumetric flow rate and/or the temperature of the liquid circulated through the at least one flow passage (Fig. 9 Item 43), and/or (ii) to control the flow rate and/or pressure of the heat transfer gas supplied between the support surface and the substrate 9coumn 15, lines 30-55).

Regarding Claim 7: Tamura et al discloses the heat transfer member comprises a base including the at least one flow passage (Fig. 9 Item 42) and a cover overlying the base (Column 6, lines 12-17).

Regarding Claim 9: Tamura et al discloses a substrate support further comprising a ceramic ring (Column 15 Lines 20-23) overlying the ceramic member and surrounding the heat transfer member and the electrostatic chuck, the heat transfer member being laterally spaced from the ceramic ring, the electrostatic chuck contacting the ceramic ring (Fig. 9 Item 36).

Regarding Claim 11: Tamura et al discloses a substrate support further comprising an elastomeric joint between the ceramic member and the heat transfer member, and an elastomeric joint between the heat transfer member and the electrostatic chuck (Column 18, lines 44-48).

Regarding Claim 12: Tamura et al discloses a plasma processing apparatus comprising the substrate support of Claim 1 (Fig. 1).

Claims 3, 15, 16, 18, 20, 22, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent

No. 5,225,663) as applied to claim 1 and further in view of Kadotani et al (US PGPUB No. 2004/0163601).

Regarding Claim 3: Tamura et al in view of Matsumura et al teach all limitations of the claim except coolant flow passage dimensions.

Kadotani et al teach an apparatus (Figures 1, 7) that includes a substrate support for supporting a wafer W and having an electrode block 1 with coolant flow passages 11, 12. Kadotani et al further teaches that dimensions of coolant passages 11, 12 could be 5 mm wide X 15 mm height and that dimensions of coolant flow passage are directly related to heat transfer from the coolant to the electrode block (like heat transfer member). It would be obvious to optimize the flow passage dimensions as per heat transfer rate requirements [paragraphs 0077].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to control (optimize) flow passage dimensions as taught by Kadotani et al in the apparatus of Tamura et al in view of Matsumura et al to obtain desired heat transfer rate between coolant and the heat transfer member.

Regarding Claim 15: Tamura et al discloses a substrate support useful in a plasma processing apparatus, comprising, a source of temperature controlled liquid (Fig. 9 Item 43), a ceramic member (Fig. 9 Item 40), a metallic heat transfer member overlying the ceramic member (Fig. 9 Item 2), the heat transfer member including at least one flow passage in fluid communication with the liquid source and through which the liquid can be circulated to heat and/or cool the heat transfer member, and an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for

supporting a substrate in a reaction chamber of a plasma processing apparatus (Fig. 9 Item 1). Tamura et al also teach a controller that controls the flow of coolant to control the temperature of holding member (heat transfer member) 2. Further, Kadotani et al teach that by controlling the size of coolant flow passages 11, 12 and flow rate of coolant therefrom, the rate of heat transfer from electrode block (like heat transfer member) can be controlled (paragraph 0077, 0088).

Therefore it would have been obvious to control the size of flow passage and rate of flow of coolant as taught by Tamura et al in view of Matsumura et al and Kadotani et al to achieve the desired cooing rate for the heat transfer member.

Regarding Claim 16: Tamura et al in view of Matsumura et al teach all limitations of the claim as explained under claim 1 above (Fig. 9 Item 2).

Regarding Claim 18: Tamura et al discloses the heat transfer member comprises a base including at least one flow passage (Fig. 9 Item 42), and a cover overlying the base (Column 6 Lines 12-17).

Regarding Claim 20: Tamura et al discloses a substrate support of Claim 15, further comprising a ceramic ring (Column 15 Lines 20-23) overlying the ceramic member and surrounding the heat transfer member and the electrostatic chuck, the heat transfer member being laterally spaced from the ceramic ring, the electrostatic chuck contacting the ceramic ring (Fig. 9 Item 36).

Regarding Claim 22: Tamura et al discloses a substrate support further comprising an elastomeric joint between the ceramic member and the heat transfer member, and an

elastomeric joint between the heat transfer member and the electrostatic chuck (Column 18 Lines 44-47).

Regarding Claim 23: Tamura et al discloses a plasma processing apparatus comprising the substrate support of Claim 15 (Fig. 1).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) as applied to claim 1 and further in view of Oda et al (US 6,474,986).

Regarding Claim 5: Tamura et al in view of Matsumura et al teach all limitations of the claim except the source of temperature controlled liquid includes a Peltier cooler operable to change the temperature of the liquid to a selected temperature.

Oda et al discloses a substrate support wherein the source of temperature controlled liquid includes a Peltier cooler operable to change the temperature of the liquid to a selected temperature (Figures 14-17, Item 106). Tamura et al in view of Matsumura et al and Oda et al are analogous art because they are from the same field of endeavor, namely semiconductor wafer heating process.

At the time of invention it would have been obvious to a person of ordinary skill in the art to form Tamura et al in view of Matsumura et al's apparatus including the source of temperature controlled liquid includes a Peltier cooler operable to change the temperature of the liquid to a selected temperature in view of the teaching of Oda. The suggestion or motivation for doing so would have been to cool the refrigerant in a cooling container to a predetermined temperature by a Peltier effect (Column 2 Lines 37-38). Therefore it would obvious to combine Tamura et al in view of Matsumura et al

with Oda et al for the benefit of the source of temperature controlled liquid includes a Peltier cooler operable to change the temperature of the liquid to a selected temperature to obtain the invention specified in Claim 5.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) as applied to claim 1 and further in view of Yatsuda et al (US Patent No. 6,488,863) and Mahawili (US patent No. 6,007,635).

Regarding Claim 8: Tamura et al in view of Matsumura et al teach all limitations of the claim except ceramic member having recess to seat the heat transfer member.

Yatsuda et al discloses a substrate support (Figure 1) that includes an aluminum worktable (heat transfer member) 18 disposed on a ceramic insulating member 18 that has flange and where an electrostatic chuck 28 is in contact with the flange portion.

Yatsuda et al do not teach that worktable (heat transfer member) 18 is laterally spaced from the flange but it would be obvious to keep a gap (space) between the flange and the worktable to allow for thermal expansion of the heat transfer member.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use ceramic member having a recess as taught by Yatsuda et al in the apparatus of Tamura et al in view of Matsumura et al to enable proper support and insulation for the heat transfer member.

Tamura et al in view of Matsumura et al and Yatsuda et al do not teach thickness of recess member at the recessed surface.

Mahawili teach an substrate support apparatus (Figure 1) that includes a second member 18 with a support surface (recess) 20. Mahawili also teach that recess is sized to allow radial (lateral) expansion of the first member (like heat transfer member) 14. Mahawili further teach that recess depth (related to thickness of recessed portion) is sized so as to allow seating of first member 14 such that substrate 12 is seated flush with the upper surface of 18a of second member 18 (column 4, lines 20-35). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use ceramic member configuration as taught by Mahawili in the apparatus of Tamura et al in view of Matsumura et al and Yatsuda et al to allow for thermal expansion of heat transfer member and also to allow for unimpeded flow of process gases across the surface of wafer (column 4, lines 30-35).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) as applied to claim 1 and further in view of Kanno et al (US 6,373,681).

Regarding Claim 10: Tamura et al in view of Matsumura et al teach all limitations of the claim except an RF power source electrically connected to the heat transfer member. Kanno discloses an RF power source electrically connected to the heat transfer member (Fig. 1 Item 7). Tamura et al in view of Matsumura et al and Kanno are analogous art because they are from the same field of endeavor, namely plasma processing substrate supports.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to form Tamura et al in view of Matsumura et al 's apparatus including an RF power

source electrically connected to the heat transfer member in view of the teaching of Kanno et al. The suggestion or motivation for doing so would have been to supply power for generating a plasma. Therefore, it would have been obvious at the time of invention to combine Tamura et al in view of Matsumura et al with Kanno et al for the benefit of a heat transfer member that could also be connected to a power source to generate a plasma.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) and Kadotani et al (US PGPUB No. 2004/0163601) as applied to claim 15 and further in view of Yang et al (US 6,635,580).

Regarding Claim 17: Tamura et al in view of Matsumura et al and Kadotani et al teach all limitations of the claim including a controller operable to control operation of the coolant fluid (Column 15 Lines 41-47).

Tamura et al in view of Matsumura et al and Kadotani et al do not teach a heat transfer gas source operable to supply a heat transfer gas between the support surface and the substrate and a controller operable to control operation of the heat transfer gas source. Yang et al discloses a controller operable to control operation of the heat transfer gas source (Fig. 3 Item 80). Tamura et al in view of Matsumura et al and Kadotani et al, and Yang et al are analogous art because they are from the same field of endeavor, namely plasma chamber substrate holders (column 6, lines 25-50).

At the time of invention it would have been obvious to a person of ordinary skill in the art to form Tamura et al in view of Matsumura et al and Kadotani et al's substrate holder

including a controller operable to control operation of the heat transfer gas source in view of the teaching by Yang et al. The suggestion or motivation for doing so would have been to control the temperature of the substrate. Therefore it would have been obvious to combine Tamura et al in view of Matsumura et al and Kadotani et al with Yang et al for the benefit of a controller operable to control operation of the heat transfer gas.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) and Kadotani et al (US PGPUB No. 2004/0163601) as applied to claim 1 and further in view of Yatsuda et al (US Patent No. 6,488,863) and Mahawili (US patent No. 6,007,635).

Regarding Claim 8: Tamura et al in view of Matsumura et al and Kadotani et al teach all limitations of the claim except ceramic member having recess to seat the heat transfer member.

Yatsuda et al discloses a substrate support (Figure 1) that includes an aluminum worktable (heat transfer member) 18 disposed on a ceramic insulating member 18 that has flange and where an electrostatic chuck 28 is in contact with the flange portion. Yatsuda et al do not teach that worktable (heat transfer member) 18 is laterally spaced from the flange but it would be obvious to keep a gap (space) between the flange and the worktable to allow for thermal expansion of the heat transfer member. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use ceramic member having a recess as taught by Yatsuda et al in the

apparatus of Tamura et al in view of Matsumura et al and Kadotani et al to enable proper support and insulation for the heat transfer member.

Tamura et al in view of Matsumura et al, Kadotani et al and Yatsuda et al do not teach space between flange and heat transfer member.

Mahawili teach an substrate support apparatus (Figure 1) that includes a second member 18 with a support surface (recess) 20. Mahawili also teach that recess is sized to allow radial (lateral) expansion of the first member (like heat transfer member) 14 (column 4, lines 20-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use ceramic member configuration as taught by Mahawili in the apparatus of Tamura et al in view of Matsumura et al, Kadotani et al and Yatsuda et al to allow for thermal expansion of heat transfer member (column 4, lines 30-35).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura (US 6,676,805) in view of Matsumura et al (US patent No. 5,225,663) and Kadotani et al (US PGPUB No. 2004/0163601) as applied to claim 15 and further in view of Kanno et al (US 6,373,681).

Regarding Claim 21: Tamura et al in view of Matsumura et al and Kadotani et al teach all limitations of the claim except an RF power source electrically connected to the heat transfer member.

Kanno et al discloses an RF power source electrically connected to the heat transfer member (Fig. 1 Item 7). Tamura et al in view of Matsumura et al and Kanno are analogous art because they are from the same field of endeavor, namely plasma processing substrate supports.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to form Tamura et al in view of Matsumura et al and Kadotani et al's apparatus including an RF power source electrically connected to the heat transfer member in view of the teaching of Kanno et al. The suggestion or motivation for doing so would have been to supply power for generating a plasma. Therefore, it would have been obvious at the time of invention to combine Tamura et al in view of Matsumura et al and Kadotani et al with Kanno et al for the benefit of a heat transfer member that could also be connected to a power source to generate a plasma

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Fiorito whose telephone number is (571)272-7426. The examiner can normally be reached on Standard.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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